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SUBJECT: EARTH, WIND, AND SOLAR: MAKING RENEWABLES HAPPEN IN MONGOLIA

¶1. (U) SUMMARY: Mongolia's abundant animal, solar, wind, and hydro resources offer tremendous opportunities for the government and private investors to establish a vibrant renewable energy sector. The government openly encourages development of these resources, but apart from intermittent successes among a range of small projects, widespread, successful, sustained use of renewables continues to prove elusive. Lack of institutional capacity to assess the precise nature of renewable energy sources and to develop and execute projects and programs remain the key impediments to advancing renewable energy use in Mongolia. END SUMMARY.

MONGOLIA: HOME TO VAST RENEWABLE POSSIBILITIES

¶2. (U) Animal waste, sun, wind, and water are Mongolia's most abundant renewable energy resources, but the country has not yet developed a comprehensive strategy to harness their power. To date, no complete study on the viability of these resources has been conducted. Informed observers, however, believe that Mongolia's rural population might benefit most from a comprehensive renewable energy strategy. Sixty percent of Mongolia's population (roughly 1.5 million people) lives in rural areas, which is also home to more than 40 million head of livestock. Many rural dwellers live outside of aimag (provincial capital) or soum (county) centers, and have no access to the central electric grids that link their respective provinces to the national power. For those who do reside in rural towns, power outages from the central grid are a regular feature of daily life.

¶3. (U) In addition, the five westernmost aimags have no connection to the central grid at all, and must rely on expensive imported power from Russia or costly diesel generators. Moreover, reliance on Russian power gives Russia a continuing hold over Mongolia. In short, the average rural dweller has at worst no power, and at best unreliable, expensive power. For these consumers, untapped renewable resources present economically viable, appropriate, and achievable alternatives.

¶4. (U) Use of renewables is not a new concept in Mongolia's countryside. Currently, almost every herder family collects and saves animal waste, especially dung, which is used for fires for cooking and heating in lieu of coal and timber. With 40 million plus livestock, Mongolia's rural population remains among the world's best recyclers. They need no lesson in the value of these fuels, although long-time observers note that more efficient stoves, combining heat retention and ease of transport, would be a plus.

INITIAL POLICY STEPS

¶5. (U) The Parliament of Mongolia has produced two main policy

documents on renewable energy. The first, the 2005-2020 National Renewable Energy Program (NREP) was released in June 2005, followed by passage of the Renewable Energy Law of Mongolia in January 2007. Mongolia, like many other countries, considers expansion of renewable energy, energy efficiency, and greenhouse gas abatement technologies as national priorities. Although the legal framework is now in place, Mongolia needs to increase the institutional capacity of both its government agencies and energy companies in order to proceed with the structural reforms that would allow the implementation of such technologies.

¶6. (U) To this end, Mongolia is seeking to develop its capacity to design, install, and operate demonstration projects on renewable energy, such as small hydropower, wind power, and photovoltaic solar projects. Organizations such as the Mongolian Academy of Sciences (MAS) and private renewable energy companies are looking to expand their respective technical bases in order to develop renewable energy projects. For example, MAS and Mongolian university experts, scientists, and technicians are actively engaged in studies in these areas.

SOLAR: BUILDING ON RECENT SUCCESSES

¶7. (U) Since Mongolia enjoys nearly 300 sunny days a year, many observers believe that solar energy is a highly suitable source for lighting and electrification in rural areas. (Note: Heating, cooking, and other needs require other energy sources. End Note.) Some small solar projects have already been successfully implemented in Mongolia. For example, the Mongolian Post and Telecommunication Authority in 1998 built a plant to manufacture photovoltaic (PV) modules with total capacity of 500 KW (a series of 12, 24, and 50 watt PV modules). The plant purchased its basic equipment from the U.S.-based Spire Corporation. Assembled modules were installed at more than 360 country-side soum and aimag telecommunication and post-office facilities. As a result, essentially every rural phone and mail station has an independent, PV-based power source to sustain operations.

¶8. (U) PV panels are also being used by nomadic herder families, since they tend to be the least expensive power source in remote areas. In 2001, the government inaugurated the "100,000 Solar Ger Program." Now managed by the Ministry of Mineral Resources and Energy (MMRE), the program, in coordination with other private resources, has already furnished more than 80,000 herder families and rural town dwellers with PV systems.

¶9. (U) While large PV systems did not make economical sense for urban users, small, portable PV applications were the logical option for remote users over gas and diesel powered generators, or even wind powered generators. PV panels are durable, easily transportable, and can be easily linked to car batteries to power lights and small appliances for rural households and gers. The government underwrote the program by covering part of the cost of the PV systems, with the herder providing a share, usually through cheap financing for the solar equipment underwritten through collaboration between MMRE and Mongolian commercial banks.

¶10. (U) The next phase of the plan is implementing larger scale solar developments in rural Mongolia. The New Energy and Industrial Technology Development Organization of Japan demonstrated the potential of dispersed PV power generation systems, installing a 200 KW system to supply the center of Noyon soum, Umnugovi aimag. This PV power generation system consists of series of dispersed PV units, which are connected through bus lines. Dispersed PV systems are installed at the soum's hospital (40 KW), school (40 KW), telecom office (10 KW), and soum administration center (10 KW). Three diesel generators with a capacity of 60 KW each were also installed and work in parallel with the PV system.

CAN WIND POWER CATCH ON?

¶11. (U) According to a 2001 USAID-U.S. Department of Energy National Renewable Energy Laboratory (NREL) report, 160,000 square km of Mongolia, or 10 percent of its territory, has good-to-excellent wind potential for utility-scale wind power applications. Using conservative assumptions about power potentials, NREL estimated that

Mongolia could reliably generate about seven megawatts (MW) per square km, or 1.1 GW, and over 2.5 trillion kilowatt-hours (kWh) per year. More than 25 percent of that potential, 300,000 MW, lies in the Gobi's massive Umnugovi province. These data show that wind could play an important role both rurally and in small urban centers.

¶12. (U) Studies show that the maximum wind potential in Mongolia is found in lower elevation regions, especially in the Gobi Desert zones near the Mongolia-China border. Fortuitously, this is also close to the most likely market for wind-power output, China. Mongolia's winds, however, are demonstrably seasonable. Maximum wind resource potential is from March through June, with April and May being the windiest months. The wind resource decreases rapidly after this period, resulting in the lower elevation areas having a wind resource minimum in July and August. The wind resource distribution for the period from October through February is more complex. Some locations show a secondary wind resource maximum in October and November and a decrease in the resource from December through February before the primary resource maximum in the spring. A few lower elevation locations have a winter (December through February) or autumn (October and November) wind resource maximum. These seasonal variations in windfall present challenges to tapping the resource effectively. Still, among renewable energy technologies, wind energy technology applied in areas with abundant wind energy resources has proven to be the most competitive in terms of cost for the bulk power market internationally.

¶13. (U) Mongolia has very little experience with wind energy. According to MMRE's Renewable Energy Officer, wind energy use remains low in Mongolia. The officer attributed this to lack of technical capacity, funding, and information. There is also a need to conduct a wind velocity survey to determine the technical and financial feasibility of this option in Mongolia.

HYDRO POWER ADVANCEMENT CAUGHT UP IN THE RAPIDS
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¶14. (U) According to Mongolian government and international reports, Mongolia has an estimated 3,800 small rivers with a total length of 65 thousand kilometers and an estimated hydro energy potential of 6.2 GW. Although hydropower resources of Mongolia have also not been fully investigated, a number of promising hydropower sites have been identified. These sites together offer more than one GW of potential hydropower, with plans in development to build plants with a combined capacity of 250 MW. In practice, however, large scale hydro power plants have proven controversial. First, regional politics complicate tapping water resources. Mongolia has few rivers deep and large enough for damming. Suitable rivers, such as ones that are part of the Lake Baikal watershed, raise concerns over how the Russians would react to Mongolia's inhibiting the flow of Baikal's prime feeder stream, the Selenge River. Second, many rivers freeze over during the winter and cannot provide sufficient flows to generate year-round electricity.

¶15. (U) In western Mongolia, the desire to free the five western provinces from dependence on Russian power sources has led to the construction of two dams connected to hydro power stations. The economic basis for both projects has been questioned by the World Bank, the Asian Development Bank, USAID, and the foreign experts advising the Chinese contractors who built them. Specifically, the projects' economic rates of return have been considered too low given the high costs of operation. In addition, in both cases estimates as to when the reservoirs will be sufficiently filled to reliably generate power have proven too optimistic.

¶16. (U) Having borrowed money to construct dams several years behind scheduled operation, MMRE officials have soured on hydro-power and have suspended or cancelled future projects. However these same officials are willing to consider mini-hydropower plants of up to one MW capacity, which could be used to supply soum centers with electricity, as an alternative to diesel plants. These are more in the vein of water mills that would generate electricity in the spring, summer, and fall months. (Note: Post has also alerted the MMRE of run of river hydro technologies which could be installed in river bottoms and not require impeding the flows of Mongolia's best hydropower sources in the Baikal watershed. We and the Department of Commerce plan to promote these possibilities at the annual

U.S.-Mongolia Business Forum in Washington in June 2009. This year's theme is energy production goods and services. End note.)

COMMENT

¶17. (U) Mongolia has rich renewable energy potential, and over the past few years has sought to develop these resources as rapidly as possible. Renewable energy is highly attractive for rural electrification in Mongolia. Enterprises of small-sized solar energy systems for nomadic families are well established, but large scale projects continue to remain beyond Mongolia's reach. The available skills, competence and managerial ability of local experts, technicians, and institutions remain insufficient to assess, select, develop, and implement projects. There is a need for capacity building through training, and for the transfer of renewable energy technologies as well as models and software for conducing economic-financial analyses and environmental impact assessments of projects.

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